

711-R-758 WELDING SPECIFICATIONS

(Revised 05-20-23)

The Standard Specifications are revised as follows:

SECTION 711, BEGIN LINE 473, DELETE AND INSERT AS FOLLOWS:

711.32 Welds

Welding of steel shall be done only as shown on the plans or as specified and only with specific approval. Welding may be performed to remedy minor defects, if approved. No temporary or permanent welds, if not shown on the plans or otherwise specified, shall be made without specific written authorization.

(a) AWS Requirements

Welding of steel bridges and bridge components, *including high performance steels*, shall be performed in accordance with AASHTO/AWS D1.5 Bridge Welding Code, hereinafter referred to as the Bridge Welding Code. Welders, welding operators, and tack welders shall be qualified in accordance with Bridge Welding Code, Clause 7, Part B.

When welding steel structural or steel non-structural tubing or steel structural supports for highway signs, luminaires, or traffic signals, it shall be performed in accordance with AWS D1.1 Structural Welding Code – Steel, hereinafter referred to as AWS D1.1. Welders, welding operators, and tack welders shall be qualified in accordance with AWS D1.1, Clause 6, Part C.

Welding procedure specifications shall be submitted to the Engineer with fully documented and accepted procedure qualification records for approval prior to any welding operations.

In general, post weld heat treatment will not be required. The use of such post weld heat treatment will require additional qualification testing.

(b) Welding of High Performance Steel

~~All welding on high performance steel shall be in accordance with the Bridge Welding Code, except as modified herein and by the AASHTO Guide Specification for Highway Bridge Fabrication with HPS 70W Steel, hereinafter referred to as the Guide.~~

~~Only submerged arc welding, SAW, and shielded metal arc welding, SMAW, processes will be allowed. Consumable handling requirements shall be in accordance with the Bridge Welding Code, Sections 12.4 and 12.5, when using reduced preheat as described in Table 3 of the Guide, except that SAW consumables for matching weld metal shall meet the hydrogen control level of H4 in accordance with Section 12.6. Consumable handling requirements shall meet the provisions of the Bridge Welding Code, Clause 6, when using the preheat requirements contained in Clause 6, except that the diffusible hydrogen level shall never exceed H8. SMAW consumables may meet diffusible hydrogen levels of either H4 or H8 except the higher preheat and interpass temperatures as noted in Table 3 of the Guide shall apply to H8 conditions.~~

~~Filler metals used to make single pass fillet welds for web to flange applications which join HPS 70W steel plates, HPS 70W to grade 50W plates, and for attaching~~

~~stiffeners and connection plates to grade HPS 70W webs and flanges, shall be in accordance with the Bridge Welding Code, Table 6.1 for ASTM A709, grade 50W base metal. Filler metals for single pass 5/16 in. fillet welds need not meet the requirements for exposed bare applications.~~

~~Filler metals used for all complete penetration groove welds joining grade HPS 70W plate to ASTM A709, grade HPS 50W or grade 50W plate shall conform to the requirements for welding grade 50W base metal.~~

~~Filler metals used for all complete penetration groove welds joining grade HPS 70W plates to grade HPS 70W plates shall conform to the requirements for HPS 70W base metal as follows:~~

~~1. Submerged Arc Welding process:~~

~~Wire LA85 by Lincoln Electric Company~~

~~Flux MIL800HPNi by Lincoln Electric Company~~

~~2. Shielded Metal Arc Welding process:~~

~~Matching E9018MR*~~

~~Undermatching E7018MR*~~

~~* The designator 'MR', for moisture resistant coating, is required for all SMAW electrodes used for welding HPS 70W steels.~~

~~The Contractor may request approval of alternate consumables for matching weld strengths in lieu of the above filler metals for SAW. The request for approval shall include documentation of successful welding and shall also include diffusible hydrogen tests, both in accordance with the Bridge Welding Code.~~

~~All welding procedures shall be qualified in accordance with the Bridge Welding Code Clause 7, Qualification. The provisions of Section 7.12 shall apply. Qualification tests shall measure strength, toughness, and ductility and results shall be evaluated in accordance with Section 7.12. If specified on the plans, additional tests shall measure the Charpy V notch toughness of the coarse grained area of the heat affected zone, HAZ. The notch in the specimens shall be carefully located in the coarse grained area of the HAZ, as determined by macro etching the specimens prior to machining and testing. The toughness requirement for the HAZ shall be the same as the weld metal.~~

~~All procedure qualification tests shall be ultrasonically tested in accordance with the requirements of the Bridge Welding Code, Clause 8, Part C. Evaluation shall be in accordance with Table 8.4, UT Acceptance Rejection Criteria Tensile Stress. Indications found at the interface of the backing bar may be disregarded regardless of the defect rating.~~

~~A representative of the Department will witness all welding procedure qualification tests.~~

~~Results of the welding procedure qualification tests and final welding procedure specifications shall be submitted to the Engineer for review and approval.~~

~~In general, post weld heat treatment will not be required. The use of such post weld heat treatment will require additional qualification testing. [moved to (a)]~~

~~Wherever magnetic particle testing is done, only the yoke technique will be allowed, as described in Section 8.7.8.2 of the Bridge Welding Code, modified to use alternating current only.~~

(c) Field Welding

Field welding shall be ~~by the shielded metal arc welding, SMAW, process and shall be in accordance with~~ *performed in accordance with the Bridge Welding Code* and the requirements herein. Magnetic particle testing will not be required on welded connections that do not carry calculated stresses. ~~All field welding shall be preheated in accordance with Clause 6 of the Bridge Welding Code.~~ The Contractor shall provide a copy of the minimum preheat and interpass temperature table to the Engineer prior to beginning welding. ~~Electrodes with a low hydrogen classification shall be used.~~
